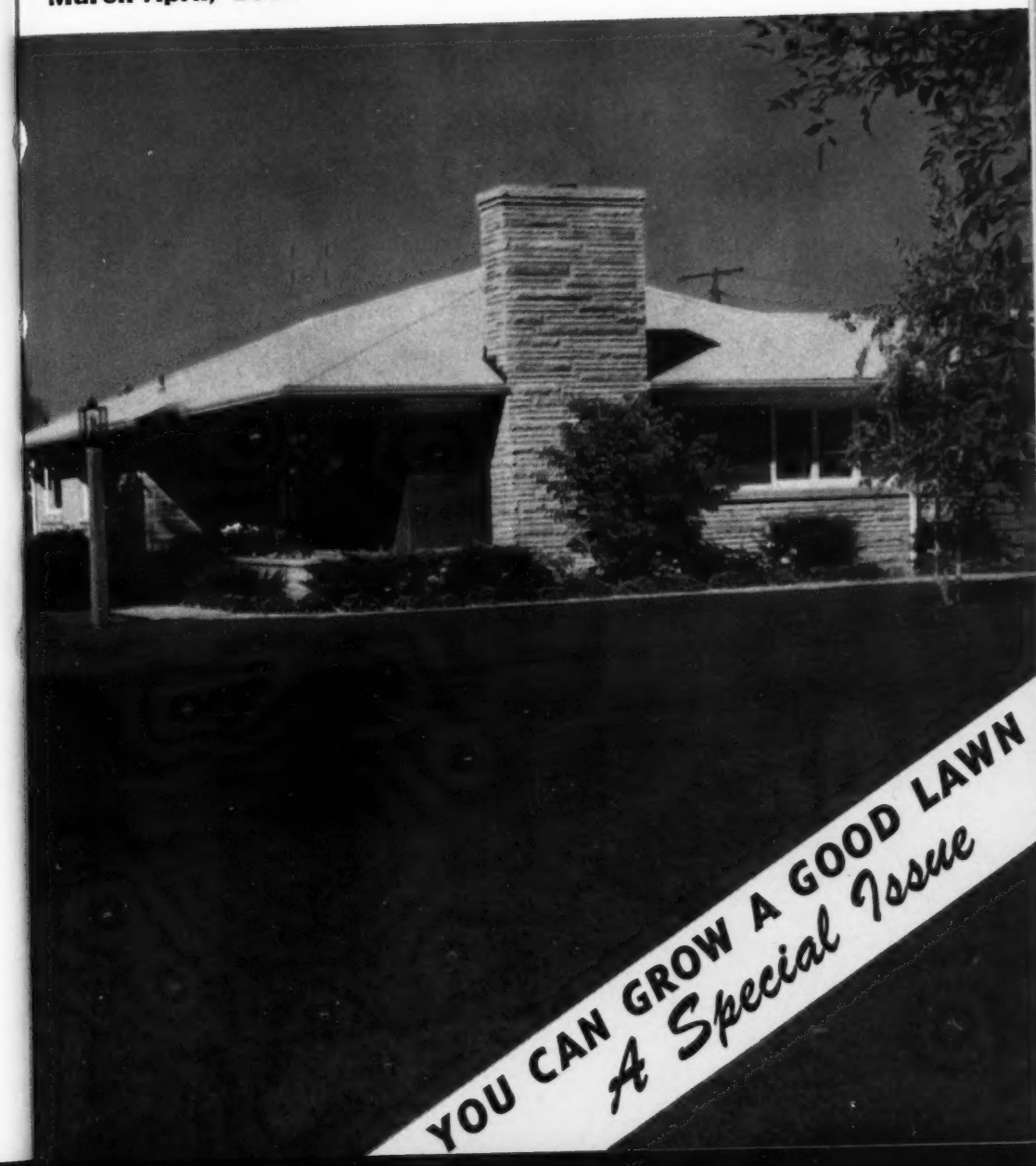
Better Crops

WITH PLANT FOOD

March-April, 1959

20 Cents



YOU CAN GROW A GOOD LAWN

A Special Issue

"HAND IN HAND WITH GOOD GRASS"

A recent study of Midwest turf soil needs, conducted by Dr. W. H. Daniel of Purdue University, shows that a large percentage of lawns to be planted, established lawns, putting greens, and fairways need more plant food than they are receiving.

The picture is probably the same in the far West, the East, and the South.

In any event, the Daniel study and a statement by Dr. Robert Schery, nationally known director of the Better Lawn and Turf Institute, helped stimulate the American Potash Institute to develop this special *Better Crops* issue on making a good lawn.

Dr. Schery advises: "Broadcasting good seed and supplying adequate plant food are prime necessities . . . for improving your lawn and building strength into your turf. Plant food goes hand in hand with good grass."

In this issue, you will find some advice on how to make a good lawn. The advice comes from specialists who are experts on the particular subject they share with you here. We are grateful to them for helping us convince you that you can make a good lawn. We invite you to read and heed what they say—and then secure the advice of your local grass and turf specialists.

sm—editor

ON THE COVER . . .

. . . the trend toward such well-groomed lawns is growing in the U. S.

In recent years, as residential suburbs have mushroomed on the perimeter of every major city and small towns have stretched their seams, *the lawn* has become one of the most important parts of the home—of its looks, its property value, its livability.

Most home owners who take pride in their lawns will tell you that it takes more than pride to make and keep such lawns. And that is what this special issue of *Better Crops* is about—how to make and maintain a good lawn.

In it, you will find facts on what grass to plant, on how important it is to check the ingredient listing on your seed box.

In it, you are told how to determine what lime and fertilizer you need—how to get good soil samples for accurate soil tests and how important it is to secure expert advice.

What is fertilizer? What are the different types? How do you use it to get top quality lawns? Such basic (but important) questions are answered.

In summary, this issue attempts to tell you how:

To prepare your soil.

To choose and plant your grass.

To mow and water your lawn.

To fertilize with a complete fertilizer for vigorous growth.

To spray with insecticide against certain insects and disease.

To spike or aerate for better penetration of water and fertilizer.

Better Crops WITH PLANT FOOD

The Whole Truth—Not Selected Truth

Santford Martin, Editor

Selma Bushman, Assistant Editor

Barbara Ott, Circulation

Editorial Office: 1102 16th Street N.W., Washington 6, D. C.

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ROMANCE ON THE LAWN

Better Crops with PLANT FOOD

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If we could live again . . .

THOSE HEEDLESS HOURS

Jeff McDermid

(ELWOOD R. MCINTYRE)

THAT old wheeze stating that hindsight comes easier than foresight fits right into the chances a lot of us passed up when we were heedless teen-age lads back in the early days of the Twentieth Century.

In those days my companion, Earl Fisher, and I lived on small sand-country places separated by a railroad track. The railroad ran through our adjoining pastures over a high roadbed. We used to pull dried mullein stalks, which our folks called "Injun tobacco," and crumble the leaves up to smoke in clay pipes. After our chores were done, we'd lie down to dream on long grass in the locust grove where the honeybees clustered busily around the fragrant white blossoms.

We'd stretch out barefoot there and look through the legume bloom above to study the great white palaces and gray castles and the shiny rosy mountains made by the slowly shifting clouds. Sometimes the droning cadences of insects and the clang of cowbells sent us off to slumber in our happy hour of idleness.

Our lack of ambition and positive plans is plain enough now after all those years. We had no access to the world of music or the arts and crafts. Both of us were, however, consistent customers of the small town "free public library," and we often watched the fast express trains tear along the gravelly bank rising above our green retreat. Then we often told each other where we'd like to go if—somehow—we could get the price of a ticket to travel far away like those passengers we saw on old number six hustling out of sight beyond Bender's Hill, puffing and blowing farewell in the shimmering sunshine.

So the library where we borrowed wonder tales of distant "high emprise" and the thundering passage of the west-bound train made vivid impressions on us—which were, however, seldom followed up or even partly fulfilled.

Our folks on both sides of our families had been raised on unproductive farms only once removed from the homespun era of the pioneers. Their schooling was scanty and it held no special lessons that might stir up hope and confidence in farming and stock raising. Most district teachers failed to see more to agriculture than long, hard, doubtful years, often ending in early wrinkles, bent backs, and achievements deferred.

Although born in a wiser day of better schools than our folks attended, Earl Fisher and I, along with his sisters Ruth and Edith, found scarcely more to fire the fuse of ambition in the grades and high school. Classes of manual training or domestic science were considered plush and purposeless by our pompous board of education, so-called. And we had no smart and courageous principal to fight the board in our behalf. We were reminded how lucky we were to bask in the rays of erudition, even through the grammar school, let alone taking four years of language, history, science, and mathematics on top of it.

A hankering for some useful subject close to the soil beset the half dozen farm fellows who went through high school with us. But neither these youngsters nor their parents got the slightest guidance or incentive to make them wiser and better farmers. Hundreds of such rural towns of our time were equally dumb and indifferent to the chance for increased trade and larger bank balances usually forthcoming in a farm-educated and farm-dedicated country community. So Stanley Seymour found no relationship between his farmstead and the lessons in mathematics and chemistry dished out daily to each and all alike. And Frank Hughes learned nothing whatever that would make him wish to remain farming with his elderly father.

There was one school topic that set well in our neighborhood, and that was history. If our folks had any escape from a round of meaningless tasks, it lay in the ardent, almost hallowed, regard they had for the soldiers and statesmen of days gone by. They lived in and doted on the tales, jokes, and folklore of the iron men of might, the glorious orators and gallant saviors in the nation's galaxy of greatness. To live by hearsay and country legend through peril and through victory at big odds lulled them into soft content.

But here, meanwhile, they neglected and overlooked the causes that cried for leadership and sacrifice—right there among them in the early morning of the marvelous Twentieth Century. Our minds as kids were shaped by our parents to venerate and imitate the heroes of the good old times. Yet, this left us slow and dull about creating new and fascinating goals and then doing something about them.

Their prevailing idea was to keep on bravely at crude farm work by the rules of our grandsires. Only a few arose to advocate a better way, and the word they spread was slow in reaching the country boys asleep in the cow pasture. Like the fairy bluebird of happiness so long

sought abroad and finally found at home, the first of those early messages of reform and regeneration seemed remote and impractical for the stub-toed farmer boy, partly in the light of his father's objections.

Great guns were being loaded and fired in those early 1900's at all the narrow, prejudiced, and outmoded concepts of an ancient age of agriculture. Very few of the echoes of this target practice by new sharp shooters of rural development ever reached Earl and me in our somnolent, satisfied environment. We did, however, in some unaccountable way get hold of a few stray bulletins put out by Cornell University's L. H. Bailey. These were nature studies tuned to the understanding of young country minds. Another glimpse of the system of exchanging new ideas and experiences at farm meetings reached us in the annual reports of the farmers' institutes. But we were unaware of their full significance and unprepared to follow up any of their new doctrines through lack of authority.

Had we lived where those first corn, calf, and pig clubs were eagerly joined by boys and girls of our generation, then the story might have been one of ambition, pride, and zeal. So, as it was back there in our bailiwick, the first waves in the flood of farm proficiency never even covered our stubby toes. We were left high and dry during the period of movable exhibits, junior clubs, country life conferences and the itinerant interpreter who became the county agent. The trouble was lack of contact and dearth of local opportunity.

Why didn't our families read about and discuss the famed Smith-Lever Act in the portentous year of 1914? Was it the tragic outbreak of the World War that put us so far behind and called so many of our chums to speed the tank and forget the plow?

Inertia made too few of us fellow converts to the program that Smith-Lever ushered in. Yet there were few signs of inertia when the farmers began their tremendous response to the cry for more wheat and pork.

Probably Earl and I were untouched by so much of the new deal in agriculture and country life betterment because the information means and methods of those early 1900's were not sufficiently widespread and appealing. These public messages never told us that we ourselves were living a new form of farm history and that we might even hope to lead something better closer to home than a bayonet charge in Flanders.

Today, not very many farm youngsters miss the chances we might have had with better organization in the community and more information to back us up. I doubt if our modern youth living in farm areas are as heedless and irresponsible as Earl and I. If that's true, then education and parental encouragement are mostly responsible for it.

I'll wager that today's farm youth esteem the values which have been so firmly established in agriculture under the original "magna charta" known as the Smith-Lever Act. I'll bet they could put on a special show on short notice, to observe the 45th anniversary of the law that opened the door for those who till the soil and tend the herds. **THE END**

HOW TO DETERMINE YOUR LIME AND F

EVERYONE wants a good lawn. Attractive shrubs, flowers, and ornamentals are also a source of pride and enjoyment.

Good lawns and attractive grounds don't just happen. They require careful management and fertile soil. If the soil is not fertile, it must be made so by applying fertilizers, lime, and various soil amendments. To decide how much lime, fertilizer, organic matter, and other materials should be added to the soil, the home owner or landscaper uses various approaches.

CONSULT THE EXPERTS

They can answer questions about your soil, identify trouble, what fertilizers and lime to add, and when.

In every state, there are authorities who have studied the needs of the soils of your area. There are experts at the colleges and state experiment stations and in the agricultural extension services.

Your local county agent and vocational teacher are usually well informed on these matters. Many nurseries and seed and garden shops have trained personnel who know how to identify trouble and what fertilizers and lime to add and when to add them. Landscape specialists have studied these matters and can offer a lot of assistance.

One of the first steps, then, in managing and fertilizing your lawn is to consult someone who knows. Don't just tackle your problem blindly or depend on your neighbor's advice. Your neighbor may have a nice lawn, but his conditions may be different from yours. It's best to talk to or write to someone who has training and experience. He will save you time and money.

READ THE CIRCULARS

On management and fertilization . . . by top specialists . . . usually free on request.

To help the home gardener, many experts have written leaflets and circulars featuring the most up-to-date information on management and fertilization practices. Most of these publications are available free.

D FERTILIZER NEEDS

BY J. FIELDING REED
ATLANTA, GEORGIA

Write to the Department of Horticulture at your state agricultural college and ask them for their latest circulars on *lawns, flowers,* or *ornamentals.*

Ask your seed and fertilizer dealer or nursery man for his literature. All of these are written in popular style, easy to read. You can save yourself a lot of trouble if you'll look these over from time to time.

HAVE YOUR SOIL TESTED

Soil testing laboratories can determine very accurately a soil's lime needs. They can also determine the levels of plant food and organic matter in the soil—information that is very helpful in estimating your fertilizer needs. These soil testing services are free in some states, and a very nominal charge is made in others. There are both state laboratories and recognized commercial laboratories.

HOW TO GET GOOD SOIL SAMPLES

If the tests are to be useful, the soil sample should be properly taken. This is really an easy procedure that takes very little time. But it must be properly done.

Often, your county agent or other local agricultural worker will be in a position to furnish instructions and assistance in taking a soil sample. If this is not convenient, write to the soil testing department at your state university or state agricultural college and ask them for instructions and containers in which to send in the soil sample. When they have tested the soils, they will send you the results and their suggestions for fertilizer and lime applications.

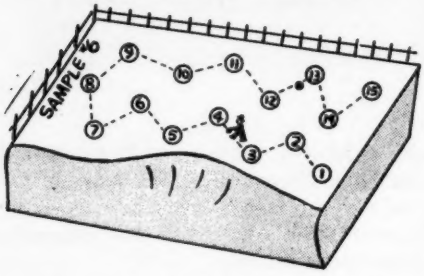
1—Use right sampling tool

A *clean* bucket, spade, and knife or a soil probe or auger.

Most instructions for taking a soil sample from your lawn will caution you to make the sample *a "composite" of 10 to 15 different "borings" or locations well distributed over the lawn.* These are taken with a soil tube or with a small trowel. If a trowel is used, be sure the amount taken from each of the "borings" is approximately the same.

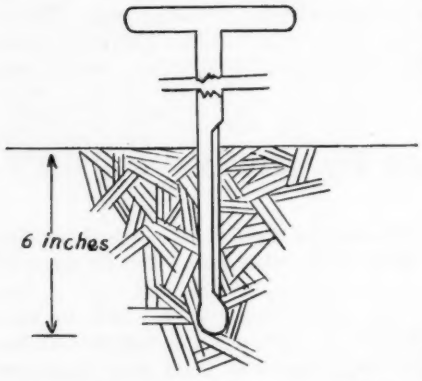
Instructions on depth of "boring" vary, but generally samples taken from *3 to 4 inches* deep are satisfactory for lawns. But a depth of *6 inches* is more general for shrub or

2—Know what a sample is



A sample is soil from 10 to 20 places in the same soil area—in this case, your lawn.

3—Depth of sample



Samples from 3 to 4 inches deep are all right for lawn—to 6 inches for shrub or flower areas.

4—When using spade

SPADE

Dig V-shaped hole 4 to 6 inches deep. Take half-inch slice from smooth side—like this.

flower areas. All of these "borings" are put in a box or bag and considered one "sample" from the lawn.

Of course, if differences exist over the lawn, you may wish to send in different "samples" to find out a possible cause of these differences.

Some folks ask, "Should I have the soil tested on my lawn, or should I follow the general fertilizer suggestions in the lawn circular?"

You can follow general recommendations for fertilizers for lawns and seldom get into trouble as long as *enough* fertilizer is added. But, before *liming*, the only *safe* practice is to have the soil tested. And it should be retested every few years—certainly before reliming any area. Too much lime can cause just as much trouble as too little lime.

TROUBLE AREAS OR SPOTS

Frequently, the home gardener finds areas or spots in his lawn that are worse than the rest of the lawn or a shrub or tree that has an unhealthy appearance. These concern

5—Mix well in clean bucket

him, and he wants to correct the cause. Often, he first assumes it is lack of fertilizer or lime.

Certainly, additions of fertilizer and lime are important, but many management practices are equally important. There are many possible causes of trouble.

Generally, the first step should be to consult the experts and read the circulars. You may be trying to grow in the shade a grass that does well only in the sun. Poor physical condition of the soil in spots, or poor drainage, or improper watering can cause trouble.

When these factors are eliminated, then consider lack of plant food, insects, or diseases as possible causes. A soil test is useful to find out if the trouble involves plant food. If there are good and bad areas, soil samples should be carefully taken from each of the good and bad areas. If the tests reveal no difficulty, then you should look elsewhere for the cause of the trouble.

Generally, only an expert can tell whether trouble is due to plant food deficiency, diseases, or insects. If it is not practical to consult an expert, have your soil tested and also send in to the state agricultural college a specimen of the affected plant. Be sure your plant specimen is large enough for the expert to examine and packaged so it reaches him in good condition. If practical, send the entire plant. You must send detailed descriptions of previous treatments and other information with the specimen.

Dr. J. Fielding Reed, Southern Director of the Potash Institute, trained at Louisiana State and Cornell. At N. C. State College, he and his associates conducted soil fertility work in peanuts that won national acclaim in 1948. He also directed soil testing work in North Carolina. He is a recognized authority on the chemistry and fertility of soil.

OTHER DIAGNOSIS

The need for fertilizers can also be estimated by testing the plant tissue and by detailed analysis of the plant. As we have mentioned, visual observations of "hunger signs" or "deficiency symptoms" can be used for diagnosis.

However, all these methods require expert interpretation. The best practice for the average gardener is to *avoid* trouble by using *soil tests, reading circulars,* and *following advice.* Usually, this brings beautiful lawns and ornamentals and a great deal of pride and joy to the home owner.

THE END

6—Put in carton to mail

WHAT GRASS TO PLANT

By Robert W. Schery,

Director,

Better Lawn and Turf Institute, Marysville, Ohio

"Every home owner should look for the ingredient listing on the seed box and demand appropriate quality species—not impermanent rye grass or other coarse hay-grasses."

LOCAL CONDITIONS IMPORTANT

THERE is no hard and fast rule about what kind of grass to use, since local conditions *(shade, slope, soil, care)* outweigh climatic generalities.

Dr. Robert Schery, Director of the Better Lawn and Turf Institute, is a nationally known authority on grass seed. He has been a featured author in 20 major magazines, a contributing author to Encyclopedia Britannica and World Book, and author of several professional studies on lawn and garden subjects. He earned his Ph.D. from Washington University in St. Louis and has traveled widely in the states and Latin America.

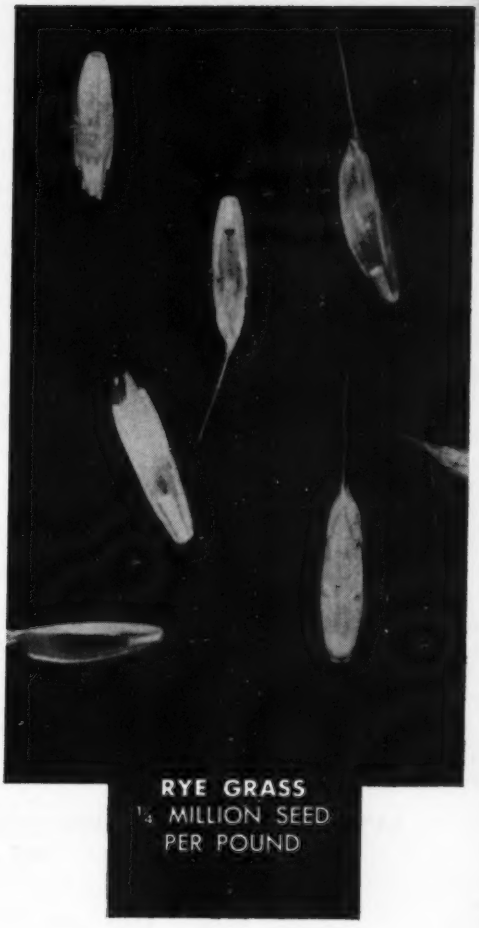
A north slope may be like climate 200 miles farther north or elevation 1000 ft. higher than a south slope just across the yard.

The map on page 12 outlines where certain lawngrasses are usually the most satisfactory.

If within any zone, the lawn is positioned to be warm and sunny—or shaded and cool—in summer, you could use grass recommended for the *adjacent zone* to the south or north.

Central states, such as Tennessee, are a good example. Except for the lowlands near Memphis, Tennessee home owners can maintain "northern" Kentucky bluegrass almost anywhere in the state. But it is more easily grown at higher elevations (as on Lookout Mountain compared to river bottom Chattanooga) and on north

BLUEGRASS
2 MILLION SEED
PER POUND



RYE GRASS
¼ MILLION SEED
PER POUND

The amount of coverage you get with seed mixture depends on the seed size—that is, *the number of seeds to the pound,* as well as characteristics of grass spread and climate. Most "cheap seed" is actually expensive. There are over two million bluegrass seeds to the pound, but only 250,000 rye grass seeds. Plant for plant, then, bluegrass is cheaper, while providing such added features as greater permanency and the ability to spread by underground stems.

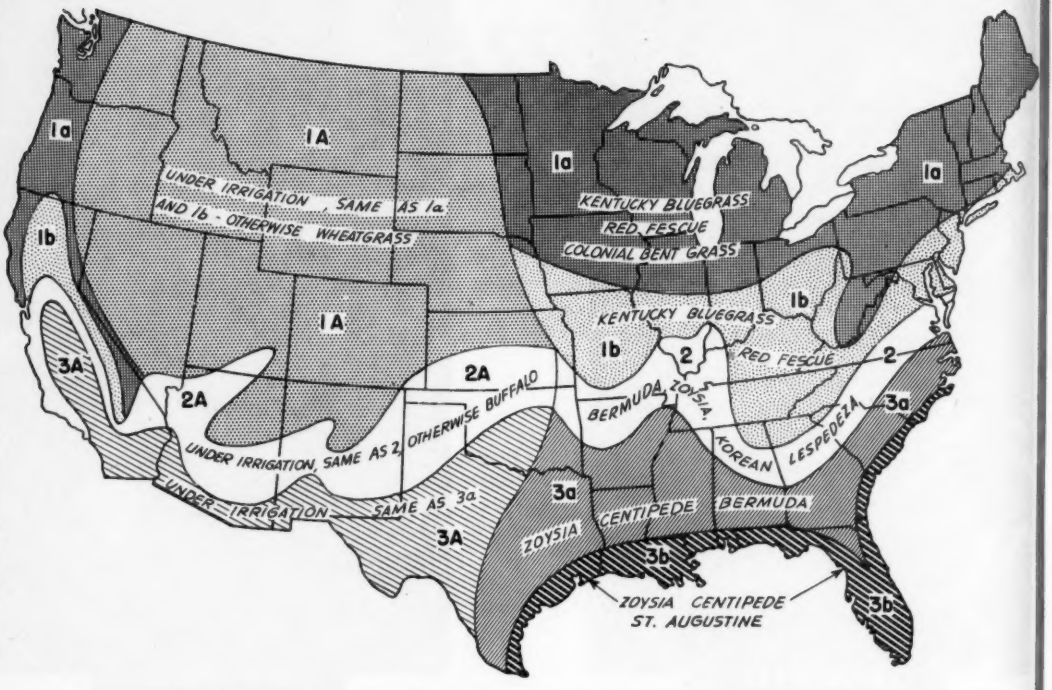
slopes and in light shade. Skilled management counts for more than it would in a state like Wisconsin. The bluegrass needs autumn, not summer, fertilization and most importantly *high mowing.*

MIXTURES ARE EASIER

Since most lawns are not tended by experts, grass *mixtures* are usually more satisfactory than a single variety. Mixtures provide grass candidates for all parts of the lawn and for different methods of mowing and care. A familiar example is *Kentucky bluegrass mixed with red fescue.* The bluegrass is basic, widely usable. And by mixing in red fescues, there is also grass for *shaded locations, droughty soils, areas impoverished by tree roots,* and *infertile sands.*

The average lawn grower is more sure with mixtures of varieties than with a single variety. Thus, Merion Kentucky bluegrass, which does very well in the northern portions of the bluegrass zone when amply fertilized, should be backed up by other varieties or by the parent natural Kentucky bluegrass.

Natural bluegrass is harvested from many fields that have existed since



LAWN GRASSES MOST APPROPRIATE FOR THE VARIOUS CLIMATIC ZONES OF THE UNITED STATES

colonial times. They are full of durable, self-made "varieties." *A hard core of natural bluegrass is an excellent broad base into which selected varieties might be mixed.*

In other instances, species may be incompatible because of the different requirements. Bent grass can form patches in an otherwise even-textured bluegrass lawn. Bluegrass and red fescue do not need the fertility, watering, and pest control that make bent luxurious. Bluegrass and red fescue resent the close clipping that bent needs to look well. Many experts are beginning to feel that bent is best not included in a seed mixture—unless you want mostly bent grass and plan for it.

In the deep South, lawns have been traditionally hand-planted from sprigs or sod chunks. This is the only way for improved Bermuda and Zoysias, which don't breed true by seed. Seeded grasses include common bermuda, centipede, bahia, carpet, and there is some seed of unselected Zoysias. These are almost as attractive as the special selections if well tended.

Westward aridity dominates. Because of the high elevation, even Albuquerque can use bluegrass mixtures. Some of the native prairie grasses, such as buffalo and the gramas, are used where watering is restricted.

On the Pacific slope, home owners use the same species and mixtures as those in the humid northeast. In coastal Oregon and Washington, bent grasses thrive well—also the bluegrasses and red fescues. Progressively southward lawns become more difficult, and in the Los Angeles area many substitutes for grass are used, such as Dichondra or other ground cover.

Often other grasses may be used. They are not included in this list because of uncertain supply, coarseness, impermanence, incomplete evaluation, etc.

ZONE 1 (1a & 1b)

NATURAL KENTUCKY BLUEGRASS, *Poa pratensis* (including Arboretum, Delta, Geary, Newport, Park, Troy); RED FESCUES*, *Festuca rubra* (including Chewings, Creeping Red, Illahee, Olds, Pennlawn, Penn State Chewings, Rainier, Trinity); Clover, *Trifolium repens.*

1a only—MERION KENTUCKY BLUEGRASS; COLONIAL BENT GRASSES, *Agrostis tenuis* (including Astoria, Berkshire, Colonial, Estacada, Highland, New Zealand Browntop, Prince Edward Island, Rhode Island); occasionally Creeping Bent, *A. palustris* (including seeded Seaside and Penncross, plus golf green varieties); ROUGH BLUEGRASS, *Poa trivialis.*

1b only—warm, difficult sites, possibly Tall Fescue; Bermudas (annually seeded, or hardy varieties such as U-3, Timnath); Redtop, *Agrostis alba.*

ZONE 2

Tall Fescue*, *Festuca arundinacea* (Kentucky-31, Alta, Goars, Grasslyn); ZOYSIAS*, *Z. matrella* (especially Meyer strain of "japonica" or Japanese lawngrass); BERMUDA, *Cynodon dactylon* (seeded or vegetative); Kentucky Bluegrass**; Red Fescue**; KOREAN LESPEDEZA, *L. stipulacea* (Rowan; Iowa 6 northward; Climax southward).

ZONE 3 (3a & 3b)

ZOYSIAS* ("matrella" strains as Flawn and Ruglawn, Manila and Mascarene grasses; Emerald); CENTIPEDE, *Eremchloa ophiuroides;* Carpet, *Axonopus sp.;* Kobe Lespedeza, *L. striata.*

3a only—BERMUDAS (seeded, and varieties such as Tiffine, Tiflawn, Texturf); AFRICAN or UGANDA, *C. transvalensis;* SUNTURF, *C. magenesii.*

3b only—ST. AUGUSTINE*, *Stenotaphrum secundatum* (including Bitter Blue); Bahia, *Paspalum notatum* (including Pensacola); Bermuda strains (Bayshore, Everglades, Ormond).

ZONES 1-A, 2-A, 3-A

These are arid versions of 1, 2, 3. The same species can be used where watering is possible, or in the higher mountains. Where irrigation is limited, some of the prairie grasses may have to be used, as:

1-A—Buffalo, *Buchloe dactyloides* (Nebraska, Fort Collins varieties); Sheep or Hard Fescue, Festuca *ovina;* WHEAT GRASSES, *Agropyron* (Crested—Fairway strain; also Intermediate, Slender, Western).

2-A—BUFFALO (including Hays, Woodward); Gramas, *Bouteloua;* Love grasses, *Eragrostis.*

3-A—Buffalo; Love grasses (Boer, Lehman, Weeping); Meadow Fescue, *F. elatior,* in Southwest.

Rye grass, perennial; and annual, Italian or domestic, *Lolium perenne* and *L. multiflorum,* are major ingredients of "cheap mixtures" in the North and temporary "wintergrass" in South; not good turf species.

Tall fescue (Kentucky-31 and Alta) is often an ingredient of "economy" mixtures, and may have some use in middle latitudes, which have hot dry summers. Like rye grass, it is not a really first-rate lawngrass, and should be avoided if possible.

* *stand shade well*
** *prefer shade*
most-useful species are capitalized

THE END

SEEDING RATES FOR LAWNGRASS

Seed Mixtures Predominately:	lbs. per 1,000 sq. ft.*	millions of seeds per lb.
I "Northerners", normally planted autumn-early spring		
Kentucky Bluegrass	2–4	2
Fescues	5–7	1/3
Bent grass	1–2	7
Poa trivialis ("Rough Bluegrass")	2–3	2 1/2
Redtop	1–2	5
Wheat grass	2–4	1/5
Clover (5–10% in mixtures)	1/10–1	3/4
II "Southerners", normally planted spring-summer		
Bermuda (hulls removed 50% lighter rate than unhulled)	1–4	2
Bahia	2–5	1/5
Carpet	2–4	1 1/4
Centipede	1/4–1	1/2
Zoysia (mostly vegetative; untreated seed slow)	1–2	5
Buffalo ("burs")	1–2	1/15
Gramas	2–4	1
Lespedeza, Korean	1–3	1/4

* Accurate, uniform distribution is seldom possible at rates less than 2 lbs. per 1,000 sq. ft., unless the seed is "extended" for greater bulk—as with cornmeal, sand, sifted soil, fertilizer, vermiculite, etc.

POTASH SHORTAGES SHOWING UP

Recent analyses from the Fort Belvoir Country Club in northern Virginia show all the greens are low in potash. We find that potassium content is frequently low—a condition apparently associated with a 10-6-4 fertilizer. Similar results have been observed elsewhere in Virginia. Last year at the Blacksburg Country Club soils on greens tested as low as 20 lbs. of potash per acre.

Instead of a 2:1:1 ratio fertilizer, perhaps in many cases we need something like a 2:1:2 fertilizer—to insure enough potash to balance the nitrogen and to insure adequate phosphate without wasting any.

R. E. Blaser, Professor of Agronomy, VPI

ATTENTION

ALL

AGRICULTURAL ADVISORS

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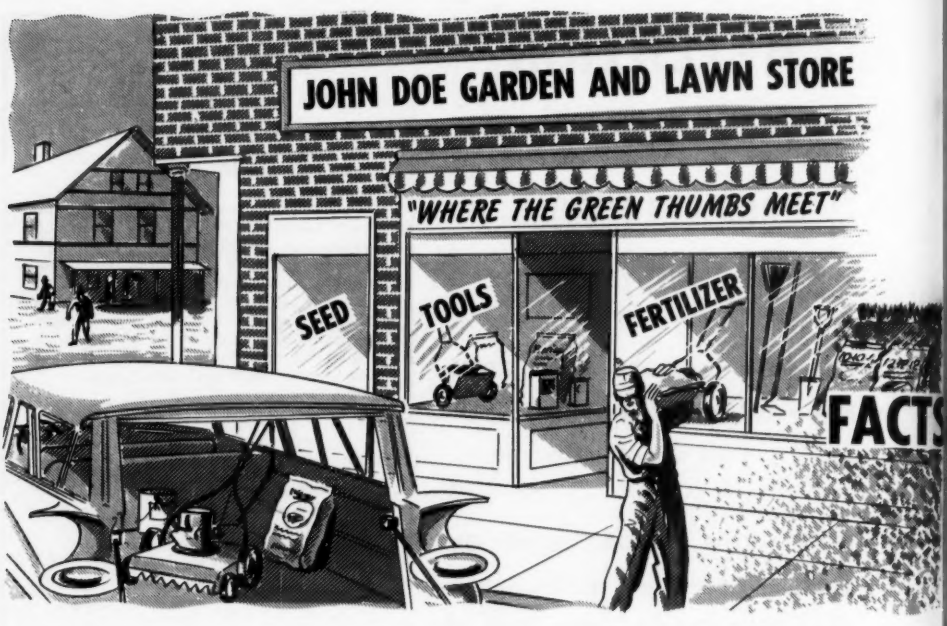


SCIENCE now recognizes more than 100 different chemical elements. Several of these, such as uranium, have become quite famous with the coming of the Atomic Age. But of greater significance to mankind, perhaps, are some sixteen others—the elements that are essential for the growth and development of plants.

All of these elements are found in nature. Three of them—*carbon, hydrogen,* and *oxygen*—occur in the air or water in amounts usually adequate for plant growth. So for practical purposes they may be disregarded. The remaining thirteen elements are found in soils in varying quantities. Some soils may have adequate amounts of all essential elements for normal plant growth. In most instances, however, a soil will be deficient in one or more of these elements.

WHAT IS A FERTILIZER?

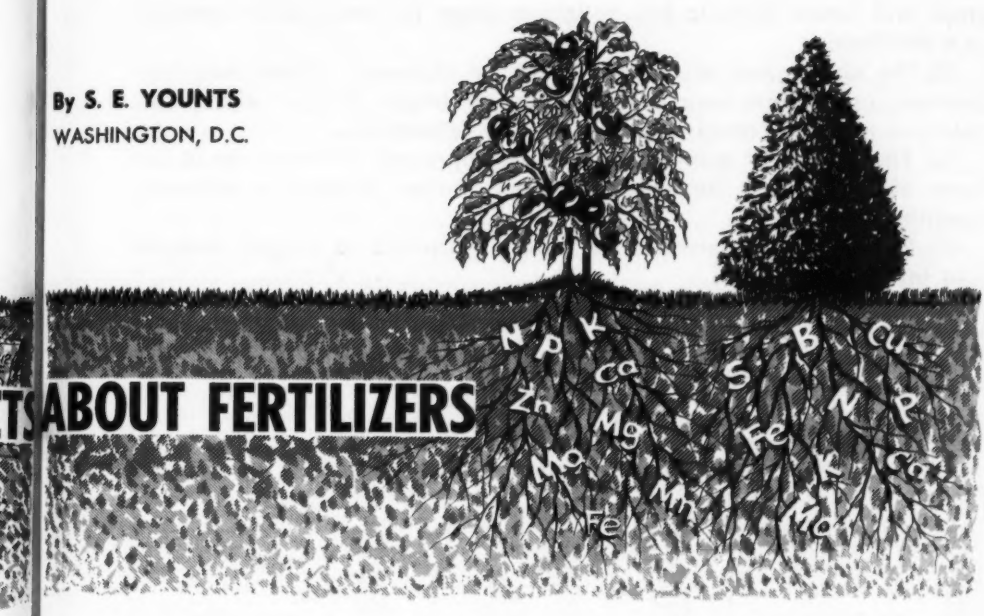
Fertilizers are used to supplement the soil supply of the essential plant nutrients. *A fertilizer then, is some substance used for the purpose of supplying one or more of the elements essential for plant growth.*

Dr. S. E. Younts, Eastern Agronomist of the Potash Institute, was formerly research assistant professor of soils at University of Maryland. He earned his B.S. and M.S. from N. C. State College, his Ph.D. from Cornell. At Maryland, he initiated important research on forage crops.

When you go to your local dealer, do you *really* know what a fertilizer is? Do you know . . .

- **Why you should use fertilizer?**
- **What the different types are?**
- **What is meant by *material*, by *grade*,**

By S. E. YOUNTS
WASHINGTON, D.C.



TS ABOUT FERTILIZERS

Nitrogen, phosphorus, and potassium (usually called potash) are the three elements most likely to be deficient in most soils. They are often called the *"primary"* or *"major"* nutrients since they are the ones with which we are primarily concerned in fertilizers.

Calcium, magnesium, and sulfur—sometimes called the *"secondary"* nutrients—are also needed in fairly large quantities by plants. However, less attention is normally given to these nutrients since adequate amounts are usually made available through lime and the fertilizer compounds used to supply the major nutrients.

The remainder—iron, zinc, copper, boron, manganese, molybdenum, and chlorine—are usually needed in small quantities and are called the *"minor"* or *"trace"* elements. These are normally added in fertilizers only in specialized situations where there is evidence of need.

WHY YOU SHOULD USE FERTILIZER

Fertilizers may benefit your plants in many ways:

(1) *Growth, yields, or production may be increased.* Many commercial

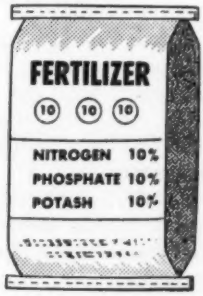
---

by *ratio*?

- **What fertilizers you should use for best results?**
- **How you should use fertilizers?**

If you don't really know, this article will help you.

KNOW WHAT'S IN YOUR BAG



crops will return three to five dollars or more for each dollar invested in a fertilizer.

(2) *The appearance of the plant may be improved.* Grass may turn greener, and plants may develop more or larger flowers with richer colors or take on a more vigorous, healthy appearance.

(3) *The quality of many crops may be improved.* This may be in the form of larger and better-colored fruit, better storage or shipping qualities, etc.

(4) Fertilizers may increase the *plant's resistance to certain diseases and insects.*

(5) *Resistance to winter and dry weather injury* may also be increased by fertilizers.

While these facts represent some of the favorable effects of fertilizers, you should remember that *improper use* may have adverse effects on many of the factors listed above, such as quality, disease, insects, winter hardiness, etc.

With proper use, however, fertilizers can be a very valuable aid in growing *vigorous, healthy, high-yielding,* and *better-quality* crops.

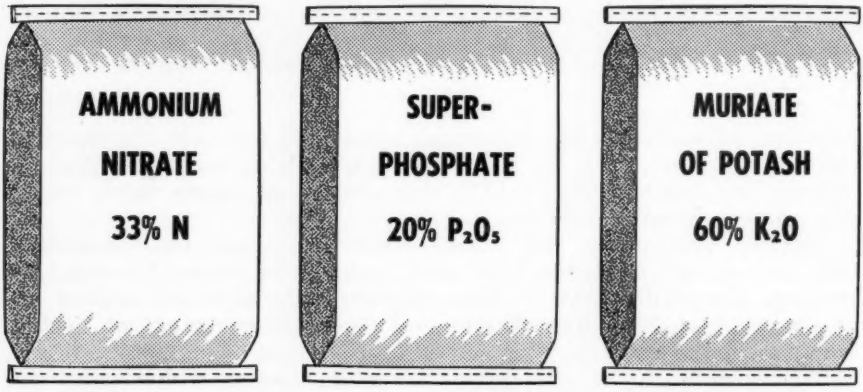


Figure 1. When you hear someone speak of "straight goods" or "single compound", they mean a fertilizer containing only one of the major plant nutrients—say ammonium nitrate, superphosphate, or muriate of potash. The per cent figure means the number of pounds of actual nutrient in 100 pounds of material—that is, a 100-lb. bag of 33% ammonium nitrate contains 33 pounds of pure nitrogen or a 100-lb. bag of 60% muriate of potash contains 60 pounds of pure potassium chloride.

WHAT ARE THE DIFFERENT TYPES OF FERTILIZERS?

Many people still think of fertilizers as being, for the most part, plant and animal waste materials. In the early days of the fertilizer industry, most of the plant food did come from such things as bone meal, dried blood, cotton-seed meal, fish scraps, and animal tankage. And before the development of the fertilizer industry, farmers fertilized their crops primarily with animal manures.

Today, however, these organic materials are comparatively expensive, and the amounts used in fertilizers are quite limited. Instead, most of today's fertilizers come from synthetically-produced chemicals or natural inorganic sources.

FERTILIZER MATERIAL

Most chemical compounds used as fertilizers contain only one or possibly two of the "major" plant nutrients. Consequently, if only one nutrient—such as nitrogen, phosphorus, or potash—is needed, this need can be met by using a single compound. Examples of fertilizer materials are ammonium nitrate, superphosphate, and muriate of potash. (See Figure 1.)

Fertilizer materials contain different quantities of the plant food elements.

For example, sodium nitrate has approximately 16% nitrogen, while the nitrogen content of ammonium nitrate may be 33%. This means that 100 pounds of ammonium nitrate contains 33 pounds of pure nitrogen, while 100 pounds of sodium nitrate contains 16 pounds N. Consequently, *it would take about twice as much sodium nitrate to supply the same amount of nitrogen as a given quantity of ammonium nitrate.*

A cardinal rule in buying and using any fertilizer is this: *look for the analysis or percent composition and base your usage accordingly.*

The nutrient needs of most crops cannot be met through the use of a single fertilizer material. Consequently, two or more materials may be combined to give a *mixed* fertilizer.

For example, ammonium sulfate, superphosphate, and muriate of potash might be mixed to give a fertilizer containing all three of the major plant foods—nitrogen, phosphorus, and potash. (Figure 2).

Most plant and soil conditions call for such a complete mixture. Many different grades or analyses of mixed fertilizers are available. State laws require that fertilizers be labeled, indicating the analysis or percent composition of all nutrients that the manufacturer claims to be present.

FERTILIZER GRADE

Figure 3 shows the type of information you will find on most fertilizer bags. The *grade* of this fertilizer is 5-10-15. In all cases, the grade represents the nitrogen, phosphorus, and potash contents, *expressed in that order as a percentage.* This fertilizer, then, contains 5% nitrogen (N), 10% phosphorus (P_2O_5), and 15% potash (K_2O).

In addition to the nitrogen, phosphorus, and potash, this fertilizer contains 17% calcium (CaO) and 12% sulfur (S). Some fertilizers may also include other essential nutrients, such as magnesium and boron or certain of the other minor elements.

The fertilizer shown in Figure 3 has a total of only 30% plant food represented in the grade. What about the other 70%—*is it just filler?* The answer is *"no."* Sulfur and calcium (CaO) make up 29%. The other 41% is made up, for the most part, of other elements, such as carbon, hydrogen, and oxygen which are combined chemically with the elements of primary concern.

The fertilizer may also contain some material to aid in keeping it in good physical condition and free from caking. Figure 2 shows that almost 99% of this fertilizer is accounted for in the chemical compounds used to supply the nitrogen, phosphorus, and potash.

FERTILIZER RATIO

We have seen that a fertilizer grade is expressed as a percentage of nitrogen, phosphorus, and potash. A fertilizer ratio, on the other hand, is the ratio between these nutrients. For example, the 5-10-15 grade in Figure 1 represents a 1:2:3 ratio. A 5-10-10 grade is a 1:2:2 ratio, and a 10-10-10 is a 1:1:1 ratio.

Many times it is possible to buy more than one grade of a given ratio. For example, one might buy a 5-10-10 or a 10-20-20. *Both are 1:2:2 ratios, but the latter is twice as concentrated.* Therefore, 50 pounds of a 10-20-20 would supply the same amount of major plant food as 100 pounds of 5-10-10 (5 pounds of N, 10 pounds P_2O_5, and 10 pounds K_2O).

Remember the cardinal rule: *Look for the grade or analysis of the fertilizer you buy. Base your usage accordingly.*

What Fertilizer Should I Use?—Plants have different nutrient needs, and soils contain varying amounts of the essential plant food elements. Consequently, many different grades of fertilizer are available to meet this great variety of needs.

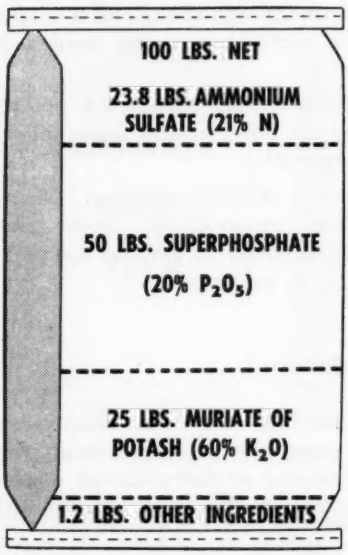


Figure 2. Two or more elements can be combined to give a mixed fertilizer. This sample contains all three of the major plant food elements.

This is very important to the farmer who, in many cases, should use several different grades to satisfy specific conditions on his farm.

However, it may not be practical for the average non-farm home owner to buy several grades when he uses only a few hundred pounds each year for all conditions. You may want to select one or two grades which best serve average needs. Other articles in this issue will discuss specific nutrient needs of various crops and how they can be determined.

HOW SHOULD YOU USE FERTILIZERS?

To be most effective, fertilizers must be *applied* properly. Methods and time of application will vary with conditions. Therefore, specific information about the fertilization of different crops or plants will be presented in the accompanying articles. We will mention only certain basic principles here.

If improperly used, fertilizers may damage plants. Placed close to the seed or near young plants, fertilizers can prevent germination, stunt growth, or even kill the plant. Applied to the surface of wet leaves, fertilizers can severely scorch or burn the plant.

To obtain the best results, everyone should follow certain basic rules in using fertilizers:

(1) Apply the amount that is recommended or that you know is desirable from past experience.

(2) Spread uniformly to avoid excessive amounts in certain spots and deficiencies in others.

(3) Don't apply dry fertilizers to wet grass. Avoid getting it on leaves of other plants.

(4) Avoid putting fertilizer in direct contact with the seed or young plants.

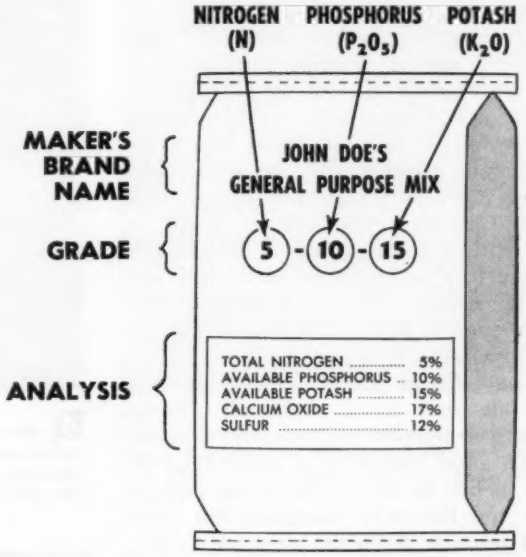


Figure 3. You will find this type of information on most bags. The grade represents the nitrogen, phosphorus, and potash contents. This sample contains 5% nitrogen, 10% phosphorus, 15% potash—in addition to other elements.

In the case of row crops, apply fertilizer in a band about 2 inches to the side of the seed and 1 to 2 inches below the seed level. You can avoid high concentrations near the seed or young plant by broadcasting some of the fertilizer before planting or by making sidedress applications after the plants begin to grow.

Remember that for best results fertilizers must be used properly. Follow these basic rules and get maximum benefits.

There is little or no difference in the effects of the *major* plant food supplied in the *dry* and *liquid* forms. So, the one you use should be determined by the price of a given amount of *plant food* (N, P_2O_5, and K_2O), considering the cost and convenience of application.

Certain of the trace elements, such as iron and manganese, can often be applied as a spray or sprinkled on the leaves of the plant. Application should be made only when there is some evidence of need. **THE END**

BASIC STEPS TO A GOOD LAWN

• *Prepare your soil properly.* Spade, plow, or rototill the subsoil so it can be worked. Loosen areas compacted by heavy equipment, but do it when your soil is sufficiently dry to *crumble* easily. Level out uneven places with a hand rake. Spread lime, if needed, and phosphate fertilizer over the *subsoil* before covering the topsoil. Then rake topsoil evenly over the subsoil.

• *Apply enough complete fertilizer.* Just before seeding, work a complete fertilizer into the topsoil—between 20 to 30 pounds of 10-10-10 or 12-12-12 per 1,000 sq. ft. into the upper 2-4 inches of soil. This gives new grass seedlings enough plant food to promote rapid growth and good firm turf the first season. After your lawn is established, keep it nourished with a high nitrogen fertilizer—12-6-6 or 12-12-12. Apply 10 to 20 lbs. per 1,000 sq. ft. Repeat this 2 to 4 times a year for uniform growth and a turf too strong for weeds or disease to conquer.

• *Sow a good seed mixture.* Use grass mixtures that fit your lawn conditions. Some grasses are more tolerant to shade and drought than others. Red fescue is a shade-tolerant grass. If you live in one of the regions where red fescue and Kentucky bluegrass will grow well, try a mixture of 75 per cent red fescue and 25 per cent bluegrass for the shady areas of your lawn. Reverse the percentage for the sunny areas. Apply 3 pounds per 1,000 sq. ft.

• *Water your lawn wisely.* Sprinkle your new lawn planting every day until it is well established. Then meet prolonged dry spells by leaving the sprinkler in one place 3 to 5 hours or until moisture penetrates to 5 or 6 inches. Then *wait* for your grass to "tell you" when it needs more water. Daily watering can bring on leaf spot, curvularia, brown patch, etc.

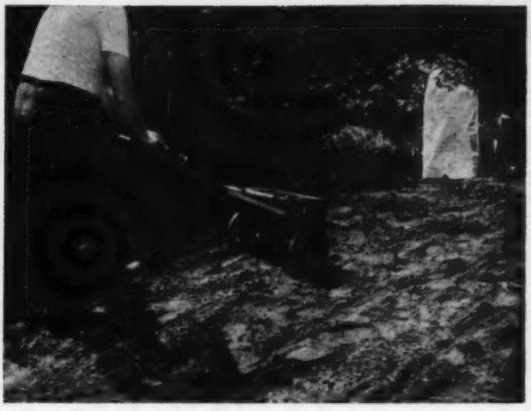
• *Mow your lawn properly.* Cool season grasses (bluegrasses and fescues) should be mowed between 1½ to 2 inches. Warm season grasses (Bermudas and Zoysias) can be cut as low as ¾ inch. Frequent mowing is important to avoid cutting too much grass at one time. Too heavy a cut will shock and smother your grass. *(Picture courtesy USDA)*

1 **Prepare your seedbed. Use spade, plow, or rototill to work up your soil. Clear all building debris or waste material before spading or tilling. Disk or rake after you rototill.**

4 **Sow seed by hand or applicator, mixed with topsoil or sand. Sow half of it in one direction and half crosswise to the first sowing. Cover by raking or dragging with brush or mat. Roll to firm seed.**

7 **Use plenty of high nitrogen fertilizer to keep a healthy lawn—10-10-10 or 12-12-12. Apply 10 to 20 lbs. per 1,000 sq. ft. Repeat 2-4 times a year. This type spreader is a handy tool for applying plant food.**

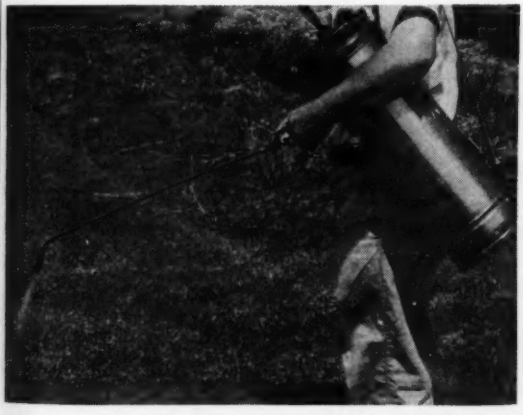
2 Level uneven places with a hand rake. Slope the subsoil away from the house. A good drainage grade is one foot in 50 linear feet. Don't work soil when it is too wet. Work when it crumbles readily.



3 Spread lime, if needed, and phosphate fertilizer over subsoil before raking topsoil evenly over it. Work 20 to 30 lbs. per 1,000 sq. ft. of 10-10-10 or 12-12-12 into the upper 2-4 inches of topsoil.

5 Newer Bermuda or zoysias do not produce seed true to type. Plant plugs of sod or sprigs in measured intervals. Usually one foot apart. Heel plugs into place. Keep moist until established.

6 Sprinkle daily until established. Don't over-water. After established, *do not* water lightly at frequent intervals. This causes shallow roots and weeds. Water when it needs 5 to 6 inches.



8 Fight insects with sprays or dusts to avoid damage to lawn. Spray on chemicals mixed with water in garden-type sprayer. Spread dusts or granules with hand duster or fertilizer spreader.

9 Spike or aerate your lawn for better penetration of water and fertilizer. It causes better growth. Machines can be rented from equipment dealers or landscape gardeners. Or you can contract the job.

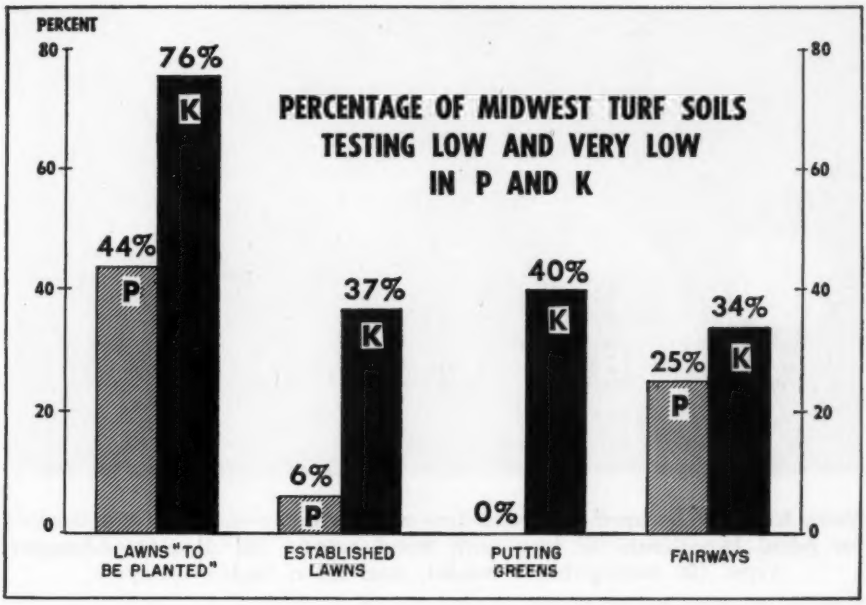
"To get a uniformly green lawn, you must apply nutrients to promote the growth of new leaves and the healthy looks of existing leaves."

IF someone were to ask you, "How long does a grass blade live?", could you tell them?

Yet, when talking about fertilizing your lawn grasses, you should understand this key fact as a basis for good turf management. To get a uniformly green lawn, you must apply nutrients to promote the growth of new leaves and the healthy looks of existing leaves.

But, how much of each nutrient is adequate and satisfactory for good, dense turf? Let's explore some basic principles.

Research has shown that larger, greener grass blades are produced when nutrition is high and favorable. That part of the leaf remaining *below* the



TURF SOILS ARE USUALLY MUCH LOWER IN POTASH THAN IN PHOSPHORUS

By W. H. Daniel **Turf Specialist** **Purdue University**

clipping level is the *last* to develop, for new cells are created *just above the leaf base*—not out at the tip.

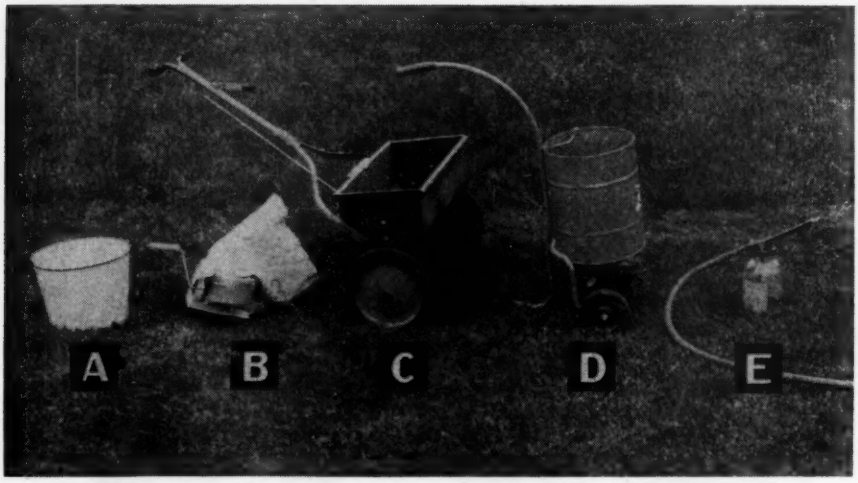
For example, a growing leaf will be cut each of three mowing periods. Then if conditions are favorable, the leaf exists as a mature leaf just below cutting level for perhaps 6 weeks. Replacement of old and diseased leaves regularly is the one key to a dense, green, weed-free lawn.

TURF NEEDS REGULAR FERTILIZATION

Thanks to research on turf fertility and soil test summaries, more is now known about specific turf needs. The same principles turf superintendents follow in grooming golf courses can be applied to small lawns and the grounds of modern residences.

Grass needs more nitrogen than any other nutrient. Clippings on a dry

Dr. W. H. Daniel, native of Arkansas, is Professor of Agronomy at Purdue University. He received his advanced training at Michigan State. He is a recognized national authority on turf, who joined Purdue in 1950. He is now Turf Grass Specialist and Secretary-Treasurer of the Midwest Regional Turf Foundation.



Many tools can be used to spread lime and fertilizer—such as (A) a bucket for hand broadcast, (B) bag with hand rotary, (C) drop-from-hopper type, (D) rotary-throw model, and (E) a liquid sprayer.

weight basis may have as much as *6% nitrogen, 1% phosphorus, 4% potassium.* Through greenhouse tests, it has been estimated that half the soluble nitrogen you apply may be recovered in the clippings, or dropped as clippings to decompose. But research also shows adequate nitrogen, even for average growth, *can seldom be stored in the rootzone of grasses for as much as one year.* This is an important limitation in lawn management, encouraging repeated use of nitrogen on turf areas. Turf quickly thins and yellows when deficient in nutrients.

WHAT DO LAWN SOILS CONTAIN?

All states have either state, county, private, or service groups that will test your soil samples for modest fees. You may consider the results of these tests something of a bank statement, or an inventory of what nutrients (fertilizers and lime) your soil needs.

The many soil types throughout the United States vary greatly in their fertility. A summary of soil tests for phosphorus and potassium in many turf areas is charted in the illustration on page 27.

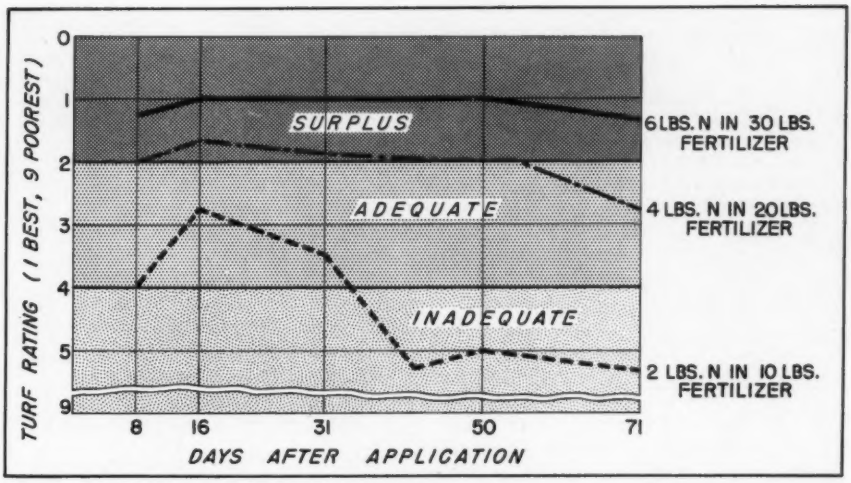
In this illustration, the need for potash on all 4 types of turf areas is evident. However, phosphorus needs are soon met by fertilization, and those areas repeatedly fertilized can actually accumulate excess phosphorus.

But, far more important is the fact that most lawn owners should not run short in their phosphorus and potassium nutrient. For this reason, you should use some phosphorus and especially potassium each year.

LIME IF NEEDED

Summaries of soil tests are valuable in showing general needs, as illustrated in Table 1. Since soil testing is widely available, a pH test to determine acidity is always suggested before liming.

In general, if your soil is below pH 6.0, you need lime. In the Midwest, only about 15% of the *established lawns* needed lime. But among the lawns to be planted, almost half of them needed lime.



Here is the rating of turf quality when 20-10-5 (applied Sept. 10, '58) was used at 30, 20, 10 lbs. per 1,000 sq. ft. on Merion Bluegrass.

In most of the eastern and southern parts of the United States, periodic (3-5 years) applications of lime may be needed.

In the western half, or where hard water is used in irrigation, lime may not be needed.

On new lawns, where pH is below 6.0, you should work into the seedbed from 50-100 pounds of agricultural lime per 1,000 sq. ft. If 6.0-6.5, you may apply one half these amounts.

On established lawns, where tests show lime is needed, repeated lighter applications (25 lbs. per 1,000 sq. ft.) may gradually correct acidity. Lime may be applied by spreaders or even by hand. To apply uniformly, spread one half *lengthwise*, the other half *crosswise* over the area.

AMOUNT OF FERTILIZATION NEEDED

Good management of adapted turfgrasses always includes *adequate fertilization*.

For cool-season grasses—bluegrasses, fescues, bent grasses, and mixtures including these, which respond best to spring and fall feeding —five alternate systems are listed. Each attempts to provide uniform and adequate NPK for desired growth.

For warm-season grasses—Bermudas, Zoysias, St. Augustine, bahia, etc. which usually have a longer growth period—heavier spring and summer feeding is preferred. And since leaching is more severe in warm climates, that have more rainfall, you should use plenty of nitrogen. Rates

Table 1.—pH of Midwest Lawn Soils

	Acid, Below 6.0	Slightly Acid, 6.0–7.0	Alkaline, Above 7.0
	%	%	%
Established lawns	15	40	45
To be planted lawns	40	35	25

Table 2.—Range of actual nutrients proposed for use on turf areas.[1]

Relative Rate	Actual nutrients/1,000 sq. ft./season		
	Nitrogen lbs.	Phosphate lbs.	Potash lbs.
Light—very low budget—fall	1	0	0
Light—divide, fall and spring	2	1	1
Medium—economy	3	1	1
Heavy—unirrigated	4	2	2
Heavy—irrigated	6	2	4
Golf putting greens	8–12	2	4–6

To get acre needs, multiply pounds × 43.5 thousand sq. ft. = 2 × 43.5 = 87 lbs. acre.
[1] Increase up to 100% for desired rates in South.

from 50 to 100% more over those below would be desired for adequate results.

Table 2 is a guide to help you determine the amount of fertilizer you should use (see table 3). For repeated use on established turf, you may adopt a fertilizer with a 4-1-2 ratio. The rapid development of high analysis lawn fertilizers shows a trend toward this 4-1-2 ratio.

NEW BETTER LAWN FERTILIZERS

Recent advances through granulation or pelletizing have revolutionized turf fertilizers. Nearly every major fertilizer producer has reduced bag sizes, produced dust-free, easy-feed granular material, and combined non-burning, slowly available ureaform nitrogen sources. These fertilizers can be applied any time you desire growth.

SYSTEMS FOR ANNUAL USE

Many lawn and garden stores carry several brands and perhaps a dozen fertilizer analyses in order to have customer preference goods for sale.

A simple program is to select a fertilizer with high nitrogen analysis —such as *12*-12-12 or *12*-6-6. Apply 10 to 20 lbs. per 1,000 sq. ft. and repeat 2 to 4 times a year for uniform growth throughout the season.

Or you might use one of the following systems:

System I

1—*Use a complete fertilizer in early spring, 10-20 lbs. per 1,000 sq. ft. of A, B, C, D in table 3.*
   a. To provide N for spring period
   b. To provide P—keep supply adequate
   c. To provide K—replenish potash
   d. To start new growth—green up lawn

Table 3.—Some examples of turf fertilizers available.

	Approximate Ratios				
	A	B	C	D	E
	1:1:1	2:1:1	3:1:2	4:1:1	1:0:0
Analysis	12–12–12	12–6–6	10–3–7	20–5–5*	38–0–0
"	15–15–15	10–5–5	15–5–5	20–8–8	45–0–0
"	10–10–10	14–7–7		20–10–5	33–0–0
		16–8–8	18–6–6	12–3–6	6–5–0
		10–6–4			

* To determine rate needed, divide % nitrogen into pounds of N wanted per application. (.20 N divided into 2.0 lbs. N. = 10 lbs. of 20–5–5 per 1,000 sq. ft.).

It is easy to see where this home owner applied 12-12-12 with a spreader.

e. To avoid burn, if a problem
f. To avoid need of rinsing
g. To thicken up turf before crab grass starts
h. This will last only until the late spring if all soluble N, or
i. This will last until early summer if 50% ureaform nitrogen

2—Then supply nitrogen for summer growth by May-July (see column E)

3—Use E or A, B, C, D to promote fall growth

System II—Use one heavy application of 20 to 30 lbs. per 1,000 sq. ft. of B, C, or D (in table 3) annually—best in late spring, to feed adequately for most of growing season.

System III—Use very light applications of N, P, K, including up to one-half pound actual N per 1,000 sq. ft., once or twice per month, with soluble nutrients dissolved or dispersed through water applications, or with thin applications of pelleted formulations, either of which feed turf by repeated small additions. Golf putting greens are often managed this way.

(Continued on page 30)

A GOOD ONE-PACKAGE PROGRAM

For many home owners, a simple program would be to select a fertilizer with high nitrogen analysis—for example, *12*-12-12 or *12*-6-6. Apply that at rates of 10 to 20 lbs. per 1,000 sq. ft. and repeat 2 to 4 times a year for uniform growth throughout the season. This provides a one-package fertilizer purchase that may also be used on garden, flowers, trees, and lawn throughout the season.

System IV—Golf putting greens and irrigated, well-fed lawns may be fed phosphorus *annually*, potash *monthly*, and nitrogen *biweekly* when growing. With new formulations of U-F, as well as organic nitrogen sources that release nutrients more slowly, heavy applications (4 to 5 lbs. N per 1,000 sq. ft.) twice a year may save labor because of fewer applications.

FERTILIZE NEW LAWNS BEFORE PLANTING

Young grass needs a good supply of nutrients available for fast development.

We suggest a *balanced fertilizer* before planting:

1. For new lawns, a nitrogen, phosphate, potash ratio of 1:1:1, *such as 12-12-12 fertilizer,* is widely needed. A high nitrogen fertilizer, such as 16-8-8, or other 2:1:1 ratio fertilizers are often desirable.

2. Soil tests are helpful in determining fertilizer needs. In the absence of a test, *apply 20 to 30 lbs. per 1,000 sq. ft.,* or as recommended on label.

3. Fibrous roots of grass can take up fertilizer applied on the surface. However, *on new lawns the fertilizer should be broadcast and worked into the soil.*

SUMMARY

The urban user can appreciate the wide range of convenient multi-purpose fertilizers now available, which supply *maintenance levels of all nutrients* in each application. He can appreciate their ease of application, lack of burn, and dust-free characteristics. With them, he has the means for promoting the turf density and uniformity he desires.

Individual grass leaves starting, growing, and dying compose the ground cover on your turf areas. After proper mowing, adequate fertilization is the next step toward dense, uniform turf. **THE END**

ATTENTION

LAWN AND GARDEN MAKERS

THIS SPECIAL ISSUE ON LAWNS WILL BE FOLLOWED BY A SPECIAL ISSUE ON GARDENING

•

THE TWO ISSUES WILL THEN BE CONVERTED INTO A HANDBOOK ON MAKING AND MAINTAINING GOOD LAWNS AND GARDENS

•

GOOD FOR LONG-TIME USE . . . THIS FALL . . . NEXT SPRING . . . AND FOR MANY SEASONS TO COME

•

SEND IN YOUR NAME TODAY TO RECEIVE A FREE HANDBOOK IN JUNE. PLEASE INDICATE LAWN AND GARDEN HANDBOOK BY YOUR NAME AND ADDRESS

•

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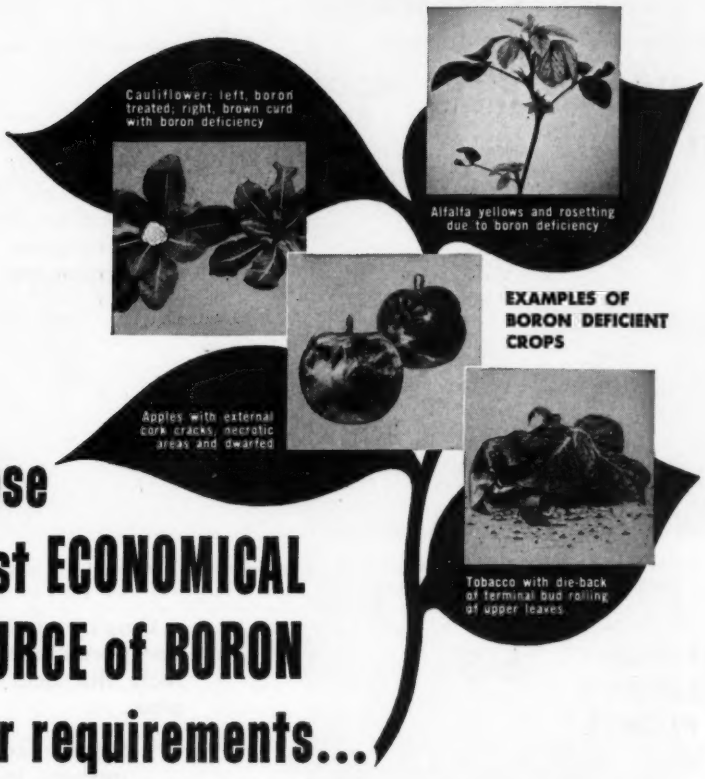
American Potash Institute
1102 16th Street, N. W.
Washington 6, D. C.


Cauliflower: left, boron treated; right, brown curd with boron deficiency
Alfalfa yellows and rosetting due to boron deficiency
EXAMPLES OF BORON DEFICIENT CROPS
Apples with external cork cracks, necrotic areas and dwarfed
Tobacco with die-back of terminal bud rolling of upper leaves

Choose the most ECONOMICAL SOURCE of BORON for your requirements...

If your need is this	*Team up with this*
■ **MIXED FERTILIZERS** ***1. Complete Fertilizers*** ***2. Granulated Fertilizers*** ***3. Granular Blends***	■ **FERTILIZER BORATE-65** **Concentrated** **or** ■ **FERTILIZER BORATE-46** **High Grade**
■ **LIQUID FERTILIZERS** **or** ■ **FOLIAGE APPLICATIONS**	■ **SOLUBOR®** (POLYBOR-2)® **or** ■ **BORAX FINE GRANULAR**

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pH VALUES

TOO ALKALINE FOR MOST PLANTS

8.0 **MODERATELY ALKALINE (SWEET)**

7.5

7.0 **NEUTRAL**

BEST FOR A MAJORITY OF PLANTS

6.5

6.0 **MODERATELY ACID (SOUR)**

TOO ACID FOR MOST PLANTS

5.5

5.0 **STRONGLY ACID**

4.5

Most soil testing laboratories will report how acid your soil is in terms of pH. This pH scale tells how acid or alkaline a soil is in much the same way numbers of a thermometer show heat or cold.

Lime is important to your lawn and garden soils. It not only corrects the acid in your soil, it also . . .

- **Supplies calcium—also magnesium, in some cases.**
- **Stimulates good bacterial activity.**
- **Improves structure of heavy soils.**
- **Causes other plant food elements to become more available.**
- **Helps fertilizer work more effectively.**

For the what's, when's, where's, how's, and why's of lime, read this article.

Although you won't be growing orchardgrass on your lawn, this experiment on orchardgrass in pots shows what lime can do for your grass when your soil needs lime. Here a moderately high rate of complete fertilizer was applied uniformly on all pots. The only difference was lime applied to give pH 5.3, *pot 5* limed to pH 6.0, and *pot 7* to pH 6.7. The grass had not been clipped at this time. (This picture presented through the courtesy of Drs. W. V. Chandler and E. F. Sullivan of Pennsylvania State University.)

LIME AND ITS EFFECTS ON SOILS AND PLANTS

"It is like a foreman in a factory in seeing that many factors operate to give top output."

By Werner L. Nelson **Lafayette, Indiana**

SOILS that are acid need lime. Many home owners are faced with acid soils, especially those in the eastern half of the United States. For example, a summary of soil tests from 100 Midwest lawns to be planted showed that 40% of them needed lime.

On acid soils, lime is the backbone of good plant growth. *It should be the first step in soil improvement.*

HOW DO SOILS BECOME ACID?

Over the years calcium and magnesium, the alkaline constituents in the soil, are replaced by hydrogen and lost in the drainage water. Also, nitrogen

develops acidity in the soil. While nitrogen is essential for good growth of grass, heavy applications help to make the soil more acid.

WHAT IS LIME?

Agricultural lime is a calcium or calcium and magnesium carbonate capable of correcting soil acidity. The lime available to the home owner will likely be calcium carbonate ($CaCO_3$) or a mixture of calcium and magnesium carbonate ($CaCO_3$ and $MgCO_3$).

WHY LIME AN ACID SOIL?

The fact that a soil is acid doesn't mean that it is poor and no good. The acidity is simply a signal that the soil's supply of calcium and magnesium is getting low and needs to be replenished. The more acid the soil the greater the need for lime in order to obtain good plant growth.

LIME—THE "WORK HORSE" IN THE SOIL

Lime does many jobs in an acid soil.

Supplies calcium and magnesium. These are nutrients needed by the plant. Calcium is present as a necessary insoluble calcium pectate in the cell wall of plants. This enables erect growth as much as the calcium phosphate in the bones of animals does for them. Calcium and magnesium also help to neutralize the organic acids that are formed in plants.

Magnesium is an essential part of chlorophyll, the green substance in the plant. In addition, it is valuable in manufacturing carbohydrates, fats, and proteins.

Corrects soil acidity. Under acid conditions toxic amounts of aluminum, manganese, and iron are soluble and are taken into the plant. Lime in proper amounts reduces the amounts of these elements in solution.

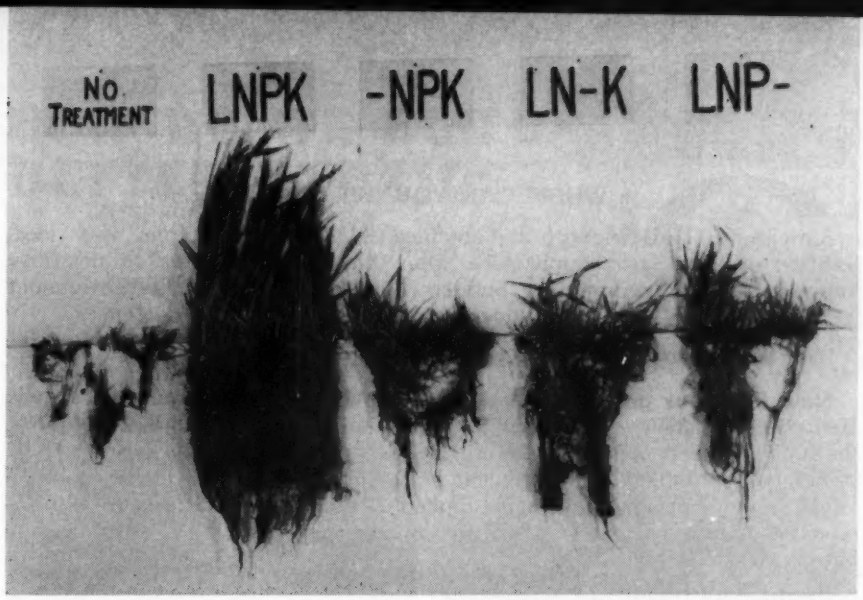
Makes phosphorus more available. Phosphorus is most available at pH 6.0-7.0 on most soils. This means that phosphorus from the soil or from the fertilizer will be used more efficiently.

Speeds up rotting of dead plant material in the soil. The bacteria which decompose soil organic matter are more active on properly limed soils. This causes faster release of nitrogen and other nutrients from the dead plants. The growing plants can then reuse these nutrients.

Reduces leaching of potassium by the rain. On a properly limed soil,

Dr. Werner L. Nelson, Midwest Director of the Potash Institute, trained at Illinois and Ohio State and served on the N. C. State College faculty. Member of several national science organizations, he was chairman of Section 9 at the 1952 International Soil Science Society in Dublin, Ireland. He is co-author of the college textbook, Soil Fertility and Fertilizers, published by Macmillan.

The Potash Institute's upcoming handbook on lawns and gardens will be made available to neighborhood dealers interested in providing their customers with such facts. Distribution policy to be announced in June.



When lime is needed to complete a balanced fertility program, it can influence plant and root growth very much. Note, here, what *no treatment* did; then *only* nitrogen, phosphate, and potash; then *only* lime, nitrogen, and potash; then *only* lime, nitrogen, and phosphate. When lime was added with all three—nitrogen, phosphate, and potash—the abundant growth was striking.

very little potassium is leached out. Thus lime causes more efficient use of potassium.

Lime is like a foreman in a factory in seeing that many factors operate properly to give top output.

HOW TO FIND OUT IF LIME IS NEEDED

The only way to find out if lime is needed is to have the soil tested and obtain a recommendation for the plants you plan to grow. Contact your state agricultural college for information on how to get your soil tested by an official or a commercial laboratory. An instrument called a pH meter is used to make the test for acidity. Few home owners are in position to do their own testing.

WHAT DOES pH MEAN

Most soil testing laboratories report acidity in terms of pH. The pH scale tells how acid or alkaline a soil is in much the same way that the numbers on a thermometer show heat or cold.

A pH of 7.0 is neutral. Values downward from pH 7.0 show increasing acidity. Values upward from pH 7.0 show increasing alkalinity. A soil with a pH 4.5 is much more acid than one with pH 6.0.

CLAY AND ORGANIC MATTER CONTENT INFLUENCE AMOUNT OF LIME NEEDED AT A GIVEN pH

The amount of *clay* and *organic matter* in the soil will determine the amount of lime needed at a given pH. For example, a sandy loam soil at pH 5.5 would need much less lime than a clay loam soil at pH 5.5. A soil testing laboratory will consider the amount of clay and organic matter along with the pH value in estimating the amount of lime you need.

WHERE CAN YOU GET LIME?

Agricultural limestone can be obtained in 100-lb. bags from your local fertilizer dealer or farm supply store. Many times "garden stores" do not carry lime. If you use hydrated or builders lime, apply about half the amount recommended for agricultural limestone.

APPLYING LIME

New lawns or gardens. Lime moves downward in the soil very slowly. Hence in new lawns or in gardens where the soil is worked 6 to 8 inches deep, the lime should be broadcast before the soil is worked. *There will never be a better opportunity to lime the soil properly.* Compared to fertilizer, much larger amounts of lime are usually applied if the soil is acid. Fifty to 100 lbs. or more of lime per 1000 sq. ft. are usually applied. This is equivalent to one to two tons per acre.

Established lawns or shrub areas. Lime can be broadcast on the surface to maintain the lime level. This should be applied on the basis of a soil test about every 5 years. Lime will not burn the plants. If heavy applications are needed, put on not more than 50 lbs. per 1000 sq. ft. at any one time.

Application. To get more even coverage, broadcast about half the lime lengthwise and the other half crosswise of the area.

A FEW PLANTS REQUIRE ACID SOILS

Some garden crops and flowers do better on acid soils. A few examples of these are:

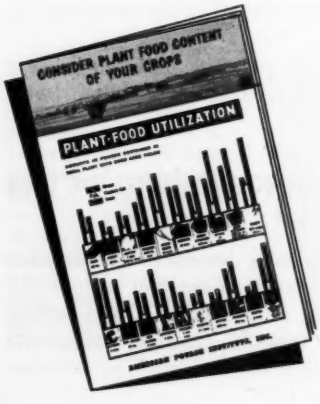
Irish potato	Camellia
Watermelon	Gardenia
Blueberry	Hydrangea
Azalea	Rhododendron

For all of these plants, except potatoes and watermelons, values above pH 5.0 to 5.5 may cause the iron in the soil to become unavailable to these plants.

DO NOT LIME IF IT IS NOT NEEDED

Soil can be overlimed, but this is unlikely if guided by soil tests. Too much lime may cause certain of the minor elements to be locked up in the soil. *Never apply lime without a soil test.*

THE END



Consider Plant Food Content of your Crops

- **Ever wondered how much plant food your crops remove from the soil?**
- **This reprint gives a composite picture of N, P, K, contained in good yields of 28 important crops.**
- **It cites large removals by legumes, plant food sources, and the trend toward higher analysis plant foods.**

Write Dept. B.C., American Potash Institute

HOW DO WE BUILD BETTER HYBRIDS?

Here are some of the things Funk's-G researchers are concentrating on to bring better hybrids to your area

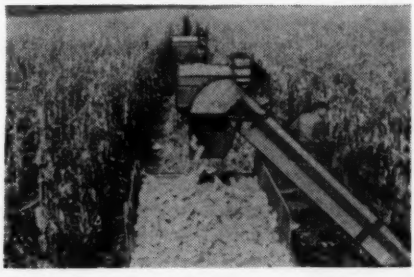
FUNK'S G HYBRID

Fast starting. Funk's-G goes right to work, starts fast ahead of the weeds, keeps on going to a big yield. Funk's-G, on left, is headed for another great crop.

Resistant to corn's major enemies, Funk's-G stands up to insects, disease, drouth. Makes a crop of sound ears when other hybrids give up and quit.

Ripe ears on green stalks. Another Funk's-G trademark. Green stalks keep feeding the ear, adding yield, weight, quality—and prevent light, chaffy corn.

Standability has long been one sure way to tell Funk's-G from other hybrids. Again last fall, when picking was late, Funk's-G was waiting, straight and strong.



Yield? The highest. Farmers' own Weigh and Compare tests prove Funk's-G outperforms them all—often yields a full extra load of corn from each bushel.

Quality corn. Farmers get the top price when they sell Funk's-G. Ask any elevator man. Deep, plump kernels weigh heavy, grade high, sell well . . . consistently.

THE PRODUCERS OF FUNK'S G-HYBRIDS

CONSISTENTLY GOOD . . . YEAR AFTER YEAR

GOOD LAWN MANAGEMENT

You, too, can have a good lawn when you select the proper grass or mixture . . . when you provide favorable growing conditions . . . when you practice sound maintenance.

By J. M. Duich
DEPARTMENT OF AGRONOMY
PENNSYLVANIA STATE UNIVERSITY

ALL home owners desire a beautiful green lawn as a setting for their home and landscape planting. You can have such a lawn by simply practising basic principles of turfgrass management *after proper establishment.*

The common complaint from agricultural extension workers is that new home owners generally pay little attention to the *planning* of their lawns. Economy buys on "grass seed" and poor soil preparation can prove to be very expensive. The first step to consider is the proper establishment of adapted grasses in a favorable growing medium.

Dr. Joseph M. Duich is an expert on lawns as a member of the Agronomy Department at Pennsylvania State University. He conducts research and teaches there. He earned both his B.S. and Ph.D. at Penn State.

Following the recommendations received with soil tests would solve most common lawn problems before they happen. Soil improvement and adequate basic plant nutrients must be incorporated before you establish your turf. When a good lawn is established, a good program of fertilization and management should provide satisfactory lawn under normal climatic conditions.

Mowing is the most frequent and time-consuming practice in maintaining your lawn. Poor mowing practices can cause your lawn to deteriorate quickly. The ability of your lawn grasses to persist in a dense turf ultimately depends on good *mowing management.*

The grass leaf manufactures food by utilizing energy from the sun and nutrients from the soil. So the manner in which the leaf surface is removed determines the efficiency of this manufacturing process—and also

MOWING

How high and how frequent are very important.

the life span of the grass plant. It is necessary that the plant maintain a balance between the manufacture, storage, and utilization of food. The two basic factors are the *height* and *frequency* of cut.

1—Height depends on the grass's growth habit.

The maximum height of cut depends on the growth habit of individual grasses.

Bunch types, such as chewings fescue and rye grass, produce new shoots inside the previous growth stem, losing much of their leaf surface and new growing points when mowed *under 9 inches.*

Rhizomatous types, such as Kentucky bluegrass and creeping red fescue, spread by underground runners which send up new shoots. This type grows rather upright and should be maintained between *1½ to 2 inches.*

Stoloniferous grasses, such as creeping bent, spread by surface runners that root and send up new shoots at frequent joints. Bermuda grass and Zoysia spread by both underground and surface runners. These three creepers can produce sufficient leaf surface under less than a *1-inch height of cut.*

2—Frequency depends on the amount of growth.

Frequency of cut is the second important consideration. At no time should mowing remove more than ⅓ of the total leaf surface. When larger amounts are removed, the plant suffers physiological shock because its food production is curtailed. Excessive cutting will eventually deplete all its food reserves. Excessive clippings on the surface may also smother the grass.

You should govern the frequency of mowing by the *amount of growth,* which in turn is controlled by the *type of grass, moisture, fertility,* and other *growth regulating factors.*

In addition to the height and frequency of cut, the mower must be sharp and in a good operating condition. Dull mowers bruise the leaf tips and destroy some of the aes thetic value of the lawn area.

WATERING

Important for good growth, but not a substitute for fertilizer and good soil treatment.

Lawns need sufficient water to maintain satisfactory growth. Grass itself is *80 percent water,* and from 500 to 700 pounds of water are used to produce one pound of dry matter.

However, *water is not a substitute for fertilizer and good soil treatment* and will not correct conditions caused

by faulty maintenance practices, such as close clipping. When turf is weakened by poor management, watering can cause only severe disease infections, shallow root systems, a waste of fertilizer, and a stimulation of weeds that tolerate such treatment.

When you must supplement natural rainfall, apply enough water to moisten the soil to a depth of 5 to 6 inches. Then add *no more water* until the lawn begins to wilt slightly. You can determine whether you are getting adequate soil moisture by slitting the turf with a spade or other convenient tool to observe the depth of moisture penetration. You will find that the quantity of water depends on the ability of the soil to *absorb* and *store* water.

Sandy soils hold the least water and clays hold the most water. Heavy clay soils absorb water more slowly than light sandy types—especially if the soil is crusted—so the quantities and application speeds must be adjusted to the absorption rate. This is very important on slopes and terraces where too rapid application can cause excessive runoff. Water absorption on slopes and compacted soils can be increased by periodic aeration with mechanical equipment.

Lawn grasses, like soils, also differ inherently in their water needs. Grasses that can tolerate drought the best are *Bermuda, Zoysia, buffalo, grama* and *the fescues.*

Grasses that love moisture the most are *creeping bent, roughstalk bluegrass, carpet grass,* and *St. Augustine.*

Kentucky bluegrass is intermediate in its water requirement.

WEED CONTROL

Cultural practices are recognized as the best, most permanent method of weed control. By cultural practice, we mean the use of proper establishment and maintenance practices (fertilization, mowing, watering) on the best grasses available. If these

WEED CONTROL

Good overall management is best control . . . chemicals are next, used with good management.

practices fail, chemical methods are then in order. You must remember that chemicals are not a cure-all and must be used in conjunction with good management practices.

Crab grass—

Crab grass is undoubtedly our worst lawn weed pest. Its control is complicated by its germination over an extended period—from spring to late summer. To kill growing crab grass, you should use 2 to 3 treatments 5 to 7 days apart. Best kills are now being obtained with disodium methyl arsenate, amine methyl arsenate, and phenyl mercuric acetate.

Several new pre-emergence chemicals, which prevent crab grass seedling infestations, are being tested at various state experiment stations. Further testing work needs to be done before they can be recommended for widespread use. However, pelleted and granular formulations of calcium arsenate, which supplies 3 to 5 lbs. metallic arsenic, and granular and soluble forms of chlordane which supplies 2 lbs. active per 1,000 sq. ft. are being merchandized, based on limited tests. *Continued on page 43*

(CUT ON DOTTED LINE—YOUR MAGAZINE WILL NOT BE HARMED—FREE MATERIALS ALSO ON REVERSE SIDE)

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• Plant Food Utilization	EE-12-57	_____
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ON SOILS AND CROPS AS LONG AS SUPPLIES LAST

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How to Get Good Soil Samples	JJ-12-58	
Increase Ladino Clover by Timing Your Potash Use	R-8-57	
Growing Good Stands of Alfalfa on Low Fertility Soils	B-1-58	
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High Nitrogen Increases Potash Needs of Grasses	DD-11-58	
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Soybean Production in the Southern States	L-3-55	
A Successful Corn Crop on the Same Land Every Year Is a Possibility	C-1-56	
The Placement of Fertilizer for Peanuts	M-5-56	
Planned Nutrition for Canning Tomatoes	V-4-55	
Building Tomato Yields Through Deep-rooted Legumes and Fertilizer Treatment	M-5-57	
Vegetable Fertilization	N-4-58	
How Soon Will Potash Be Necessary in Our Beet Growing Soils	AA-8-58	
What Is Happening to Our Citrus Soils?	X-5-55	
Fertilizing for Better Apples	EE-10-55	
Certain Practices Are Important for Successful Pecan Production	B-1-56	
Yield Response in Bartlett Pears	HH-11-58	
Fertilizers Will Cut Production Costs	HH-10-55	
The Application of Fertilizers in Irrigation Waters	H-3-56	
Potash Fertilizers & Their Behavior	C-2-57	
Lime . . . Its Placement & Penetration in Soils	H-3-57	
Fertilizer Placement	O-6-57	
Development of Potassium Use and Future Possibilities	II-12-58	
The Value of Green Manure Crops in Farm Practice	K-4-56	
Long-Range Outlook for Agriculture . . . GOOD!	A-1-57	
Growing Azaleas and Camellias—Glory of Spring	N-5-57	
Make Agronomy Your Career	A-1-58	
Potassium, Its Functions and Availability as a Major Plant Food	C-1-58	
Hidden Hunger	Q-5-58	
Irrigation Moves East	R-6-58	
The Fate of Nitrogen, Phosphorus, & Potassium	S-6-58	
Successful Crop Production Depends on Potash	T-6-58	
Band Seed Alfalfa In The Summer	U-6-58	
Balanced Fertilization First Step to Efficient Production	V-6-58	

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These and other weed control chemicals are available as liquids or powders for use in sprayers and as dilute dry formulations for use in fertilizer speaders. Since concentrations vary, they should be applied at the rate the manufacturer suggests.

Other lawn weeds—

Broad-leaf weeds—such as dandelion, plantain, and chickweed—can be easily controlled with 2,4-D. These weeds should be treated during the fall in conjunction with maintenance fertilization to encourage the grasses to fill-in bare areas. Spring control of broad-leaf weeds may open up turf and allow crab grass to infest the slower growing turfgrasses. When you want to remove clover, you can kill it with 2,4.5-T sprays or dry formulations.

OTHER TURF INJURY

Be sure you know what insect or disease you are after before you start attacking.

Lawns are subject to injury from insects, diseases, and chemicals. Often the symptoms are quite similar and it takes an experienced person to determine the exact cause. For example, urine burns from dogs are commonly mistaken for insect or disease injury.

Insect injury—

Grubs, sod webworms, chinch bugs, and cut worms are the most common insect pests. Others may cause severe damage in localized areas. To control them, you should be able to recognize the infestation in its early stages and identify the insects.

You can control several types of grubs with preventive applications of insecticides that will offer protection for 3 to 5 years. *Aldrin, Chlordane, Dieldrin, and Heptachlor* are all effective and should be applied at rates suggested by the manufacturer.

Effective control measures are available for all other turf insects. Consult your local agricultural authorities for the proper timing of your insecticide application.

Diseases—

All living plants, including lawn grasses, are susceptible to various diseases, most of which are caused by fungi. Under proper conditions of temperature and humidity, they can cause tremendous damage to specific grasses. Overstimulation of turf with excessive nitrogen *combined with close clipping* generally causes more severe damage.

The most prevalent disease in the northeast is *leafspot on Kentucky bluegrass.* Infections occur during cool, wet periods in April and May and again in the fall.

During this period, the turf is weakened considerably and may be killed following unfavorable growing conditions in June and July. Properly timed application of antibiotic and mercury fungicides can help control this disease. *Merion Kentucky bluegrass is highly resistant to the leafspot disease.*

Other common diseases are *dollar spot, brown patch, snow mold,* and *fading out.* These are most prevalent on bent grass, but they may attack many lawn grasses.

The most important step for the home owner is to get proper identification of disease or insect damage before he attempts control measures.

Satisfactory lawns are within the reach of every home owner when he selects the proper grass or mixture, provides favorable growing environment, and practices sound maintenance. **THE END**

(CUT ON DOTTED LINE—YOUR MAGAZINE WILL NOT BE HARMED—FREE MATERIALS ALSO ON REVERSE SIDE)

A tractor salesman was going along a back country road when he saw a farmer plowing his field with a bull hitched to the plow. Thinking this should be a likely prospect, he stopped his car, got out and approached the plower.

He made his pitch and then asked the farmer if he wouldn't like to buy a tractor. The farmer replied, "I've got a tractor in the barn."

"Then why in the world are you using this primitive method of plowing?" returned the salesman.

The farmer answered, "I aim to teach this critter there's something else in life besides romance!"

Mars has started moving farther away from the earth again. Don't know as we blame it, either.

Mary: "I had a quiet evening alone with a book last night."

Jane: "I'm afraid that's going to happen to me sometime, too."

The young husband wrote home from his new job saying "Made foreman—feather in my cap."

A few weeks later he wrote again saying: "Made manager—another feather in my cap."

After some weeks he wrote again saying: "Fired—send money for train fare."

His wife, unfeelingly, telegraphed back: "Use feathers and fly home."

One of the great mysteries of life is how the boy who wasn't good enough to marry the daughter can be the father of the smartest grandchild in the world.

The big, buxom wench was taken before the court and charged with being a nuisance.

"What's your name and address?" questioned the court.

"What am de diff'rence, Jedge?" replied the girl. "Yo wouldn't call on me nohow."

He was making love to a widow—a practice which may always be put down as dangerous. "My idea of love," he whispered to her, "is peace, quiet and tranquillity."

"That's not love," she said to him swiftly, "That's just sleep."

An old man had a set of monkey glands installed in his system and shortly thereafter was married. In due time his wife came to the blessed event, and the good old man waited outside the door. When the doctor opened the door, the husband besieged him. "What is it," he begged, "a boy or a girl?"

"Don't be so gol darned impatient," the doctor said. "Wait till it comes down off the chandelier and I'll tell you."

REMEMBER

FOR QUALITY NUTRIENTS . . .

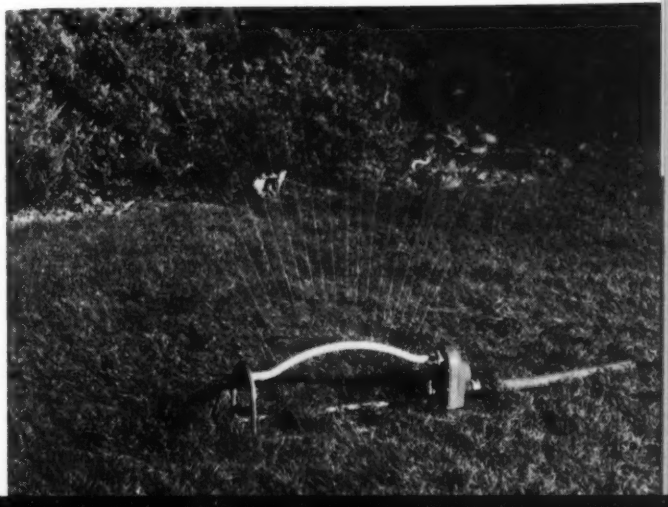
Be sure to apply a complete fertilizer—some suggest 10-10-10 or 12-12-12—and work into the upper 2-4 inches of soil at the rate of about 20 pounds per 1,000 sq. ft. This gives new grass seedlings enough plant food to promote fast growth and firm turf the first season.

FOR QUALITY SEED . . .

Be sure it is the *right* kind, in adequate quantity, clean and full-bodied, and not too light, chaffy, nor weedy. Use good seed for permanent perennial grass.

FOR QUALITY TURF . . .

Water slowly and deeply for deep roots. Mow frequently and sufficiently high for uniform growth. Fight weeds and disease with a well-managed turf (best grasses, fertilization, mowing, watering), use chemicals if needed.



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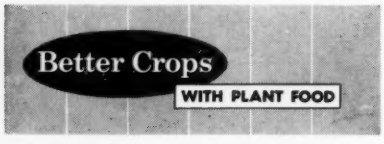

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